Epidemiology, Aetiology and Care of Eye Disease in Suriname

Minderhoud, J.

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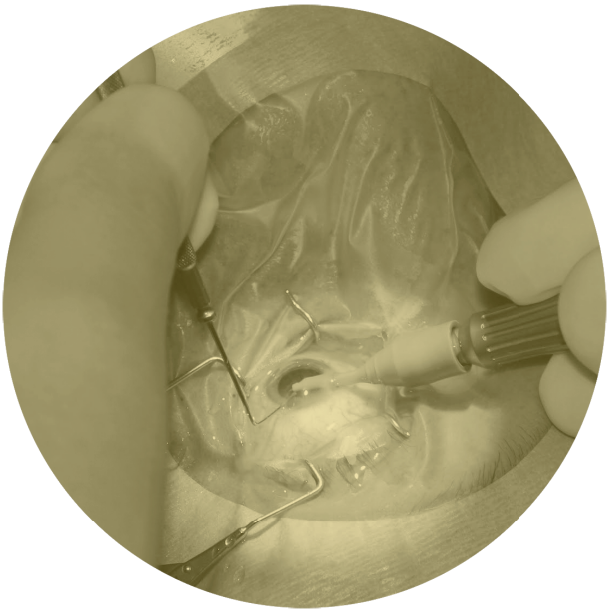
Chapter 5

Phacoemulsification under topical anaesthesia in remote areas



Janna Minderhoud
Jerrel C. Pawiroredjo
Dennis R.A. Mans
Anne-Marie T. Bueno de Mesquita-Voigt
Peerooz Saeed

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Abstract

Purpose We report the use of high-quality cataract surgery in remote areas of the Amazon in Suriname.

Setting The Amazon rain forest of Suriname, South America.

Design Retrospective observational study.

Methods We describe our experiences with the use and the clinical outcomes of phacoemulsification with intraocular lens (IOL) implantation in 88 consecutive patients. All surgeries were performed in the field under topical anaesthesia. Outcomes were evaluated by comparing pre- and post-operative uncorrected visual acuity using World Health Organization (WHO) criteria, and assessing intra- and immediate post-operative complications by Oxford Cataract Treatment Evaluation Team (OCTET) definitions.

Results Before surgery, 54 eyes (61%) where either blind or severely visually impaired (visual acuity <6/60). Only 8 patients (9%) had a visual acuity ≥6/18. At the final post-operative visit, 61 patients (70%) had an uncorrected visual acuity ≥6/18 and 8 patients (9%) remained blind or severely visually impaired. Intra-operatively, 2 cases (2%) of posterior capsule rupture (OCTET III) occurred, involving one dropped nucleus (1%).

Conclusion High-quality cataract surgery can reliably be performed in remote areas of the Amazon rain forest with a good visual outcome and a low complication rate.

Introduction

Cataract is among the leading causes of blindness in many developing countries.[1] This condition is also responsible for more than 90% of disability-adjusted life-years in low- and middle-income countries.[2] As the world population is rapidly aging, cataract is anticipated to become a major health threat in the near future.[3] Not surprisingly, strategies aimed at the prevention and treatment of cataract-induced blindness is high on the list of public health concerns of many countries. Therefore, and in keeping with the goals of Vision 2020, the Global Initiative for the Elimination of Avoidable Blindness of the World Health Organization (WHO) and the International Agency for the Prevention of Blindness have made the treatment of cataract in developing countries one of their top priorities.[1]

The Republic of Suriname is situated on the northeast coast of South America (Figure 1) and has a population of approximately 525,000. Around 90% lives in the capital city of Paramaribo and in other cities located in the narrow coastal zone in the northern part of the country. The remaining 10% inhabits the hinterland, which comprises more than three-quarters of Suriname's land surface and consists largely of dense Amazon tropical rain forest. The hinterland population exists almost exclusively of Amerindians (the indigenous peoples of Suriname) and Maroons (descendants from runaway slaves shipped from West Africa between the 16th and 19th century).[4-5] Many Amerindian tribes have settled in the southern district of Sipaliwini, while certain Maroons have established a fairly large number of small communities along the Suriname River. The majority of elder Amerindians and Maroons are illiterate and speak only their native tribal language.

The inhabitants of the hinterland are relatively isolated and are offered primary health care by the Medical Mission, a non-profit health care organization subsidized by the government. The Medical Mission has set up a system of rural clinics, dispensaries, and transport systems to urban medical posts, but does not provide secondary health care. Therefore, patients in Suriname's hinterland do not have easy access to specialized medical care, such as cataract surgery. As a consequence, this condition has become an important cause of visual impairment and blindness in elder Amerindians and Maroons.

With the aim to reduce the burden of cataract-induced blindness in Suriname, the Department of Ophthalmology of the Academic Hospital Paramaribo has started Ophthalmic Missions to these remote areas. The first screening mission was carried out in 2002, and since 2007 phacoemulsification under topical anaesthesia is being performed

in the field. Notably, the medical team had to overcome not only the relatively primitive conditions (such as the lack of electricity, running water, and adequate medical facilities), but also the language barrier between them and the local population. In this paper, we describe our experiences with the use and the clinical outcome of phacoemulsification under topical anaesthesia (without sedation) in remote areas of the Amazon rain forest in Suriname. Although the use of phacoemulsification under topical anaesthesia in mobile eye camps has been described before[6], its use in the setting of the Amazon rain forest is unique.

Patients and methods

This was a retrospective descriptive study that included consecutive patients with cataract who had undergone phacoemulsification and intraocular lens (IOL) implantation under topical anaesthesia in Laduani and Kwamalasamutu between November 2011 en December 2012 (Figure 1).

Inclusion and exclusion criteria

The pre-selection of candidates was done by health workers of the Medical Mission, and was mainly based on older age and the presence of visual complaints. Patients arrived on foot, by boot or were carried in a barrow from as far as 100 km for eye examination and treatment. Individuals eligible for cataract surgery had clinically significant lens opacity, satisfactory light perception and projection of light, and had agreed to undergo surgery. Patients who needed retrobulbar anaesthesia because of a high degree of anxiety at the time of surgery or who needed extracapsular cataract extraction because of hard or mature cataracts were excluded from the study.

Data retrieval

The data retrieved from the clinical notes included gender, age at the time of surgery, surgical details and post-operative complications, as well as pre-operative and post-operative visual acuity. The post-operative uncorrected

Figure 1. Map of the Republic of Suriname. Circle in top left: Suriname's location in South America. Circles in red: locations of the Laduani and Kwamalasamutu mobile eye camps.

visual acuity was taken at the final visit at least one week after surgery. Snellen's acuity (E chart) was categorized using WHO guidelines. [7] When visual outcome was poor (<6/60) the cause was recorded. The classification of intra-operative and immediate post-operative complications followed the Oxford Cataract Treatment Evaluation Team (OCTET) classification of cataract surgery-related complications.[8]

Surgical set-up and phacoemulsification

Equipment for the mobile eye unit was transported to the area by airplane. The operation theatre was set up in a room of a local home or medical post and the phacoemulsification system was installed. The four participating surgeons (JP, AB, HT, JHP) were all skilled in performing phacoemulsification and each had more than four years experience with the technique. Prior to the intervention, local translators gave the patients meticulous instructions in their own language. However, during the procedure, the surgeons communicated directly with the patients after having mastered the essential native expressions specifically for this purpose.

A trained ophthalmic assistant carried out biometric IOL measurements. Two hours prior to surgery, the pupil of the affected eye was dilated with topical homatropin (20 mg/mL) and phenylephrine (100 mg/mL). Topical anaesthesia with lidocaine (40 mg/mL) was administered immediately before disinfecting the conjunctiva and eyelids with povidone-iodine (50 mg/mL). For phacoemulsification, a 2.75 mm corneo-scleral tunnel incision and a separate stab incision for the second instrument were made. When necessary, the anterior capsule was stained with trypan blue (Vision Blue®, 0.6 mg/mL). Anterior capsulorhexis was created using a bent 27-gauge needle followed by hydro dissection. Phacoemulsification was performed using a Laureate (Alcon) or Legacy (Alcon) phacoemulsification system applying the divide-and-conquer technique (0.5 mL of gentamicin (40 mg/mL)) and 0.5 mL of adrenaline (1 mg/mL) was added to each bottle of balanced salt solution). The remaining cortex was removed with the co-axial irrigation/aspiration hand piece or with the bimanual technique. Hydroxypropyl methylcellulose (20 mg/mL) was used as visco-elastic. A calculated hydrophobic foldable acrylic IOL (SN60WF; Alcon) was implanted in the capsular bag.

Post-operative management

Most patients returned to their homes immediately after surgery. Those who came from far spent the night in hammocks near the clinic waiting for their first post-operative examination. Routine post-operative care included the application three times a day of a topical dexamethason-tobramycine (Tobradex®) combination (1/3 mg/mL) for three weeks, and the administration of acetazolamide (Diamox®) tablets (250 mg) to surgeon's preference to patients who had a high palpatory intra-ocular pressure 1-day post-operatively or significant corneal oedema. All patients were reviewed within twenty-four hours and subsequent visits were determined according to clinical need.

Results

Patient characteristics

A total of 92 patients had undergone surgery for cataract at the Laduani and Kwamalasamutu mobile eye camps. Four patients were selected for surgery under retrobulbar anaesthesia, two of which underwent planned extracapsular cataract extraction. In total, 88 eyes of 88 patients were included. Twenty-seven (31%) patients were male. The mean (range) age of the patients was 73 (52-88) years.

Uncorrected visual acuity before surgery and visual outcome at follow-up

Eighty-seven of the 88 operated eyes (99%) were examined at the final visit. Before surgery, 61% of the operated eyes were either blind (less than WHO category 3/60; Table 1) or severely visually impaired (less than WHO category 6/60; Table 1). Only 9% had satisfactory vision (WHO category 6/18 or better; Table 1). At the final post-operative visit, poor visual outcome (less than WHO category 6/60) was

noted in 9% of the eyes, while good vision (WHO category 6/18 or better) was found in 70% of the eyes that had undergone phaco-emulsification with IOL implantation (Table 2). When considering that 67 of the 87 patients had better vision after surgery according to the WHO classification, it can be concluded that the procedure had improved vision in more than 77% of this patient population.

Causes of poor visual outcome

Seven of the 8 eyes with acuity <WHO category 6/60 at follow-up had pre-existing ocular pathology including end-stage glaucoma, branch retinal vein occlusion, idiopathic optic atrophy, or extending pterygium. The poor outcome of one eye was caused by corneal decompensation.

Complications

Two intra-operative complications occurred in two eyes (2.3%) (Table 3). Both cases involved posterior capsule rupture of OCTET grade III. One case required anterior vitrectomy with IOL implantation in the sulcus. The other case involved a dropped nucleus and was transported by air to the Academic Hospital Paramaribo for pars plana vitrectomy.

In all, 44 patients (50%) did not have any immediate post-operative complications (Table 4). The remaining 44 patients (50%) had 45 complications comprising OCTET grade I complications in 43 patients (49%) and OCTET grade II complications in 2 of them (2.3%). The latter two patients needed an extra stitch because of wound leakage. Acetazolamide (Diamox®) tablets were administered to 40

Table 1. Distribution of uncorrected visual acuity before surgery

WHO category	Level of visual acuity	Number of patients (%)
Blind	less than 3/60 – PL	31 (35.2)
Severe visual impairment	less than 6/60 to 3/60	23 (26.1)
Visual impairment	less than 6/18 to 6/60	26 (29.5)
No impairment	6/18 or better	8 (9.1)
Total		88 (100)

PL= perception of light

Table 2. Distribution of uncorrected visual acuity after surgery

Level of visual acuity	Number of patients (%)
6/18 or better	61 (70.1)
6/24 - 6/60 (borderline)	18 (20.7)
Less than 6/60 (poor)	8 (9.2)
Total	87 (100.0) †

† One patient was lost to follow-up

Table 3. Distribution of intra-operative complications

Complication	OCTET grading*	Number of patients (%)
None		86 (97.7)
Posterior capsule rupture (with only vitreous loss)	III	1 (1.1)
Posterior capsule rupture (with dropped nucleus)	III	1 (1.1)
Total		88 (100)

* Grade I: trivial complications that may need medical therapy but are not likely to result in a marked drop in visual acuity; grade II: intermediate complications that need medical therapy and will result in a marked drop in visual acuity if left untreated; grade III: serious complications that need immediate medical or surgical intervention to prevent gross visual loss.

Table 4. Distribution of post-operative complications

Complication	OCTET grading*	Number of patients (%)
None		44 (50.0)
Transient corneal oedema	I	26 (29.5)
Transient corneal oedema + descemet membrane folds	I	17 (19.3)
Wound leakage	II	2 (2.3)
Total		88 (101.1)*

*Grade I: trivial complications that may need medical therapy but are not likely to result in a marked drop in visual acuity; grade II: intermediate complications that need medical therapy and will result in a marked drop in visual acuity if left untreated; grade III: serious complications that need immediate medical or surgical intervention to prevent gross visual loss.
*One patient had two post-operative complications

patients (45%) to lower intra-ocular pressure and/or to reduce corneal oedema. It is worth mentioning that raised intra-ocular pressure could not, by definition, be attributed to the procedure itself and was therefore not considered a complication.

Discussion

Cataract is the leading cause of blindness in many developing countries.[1] One of the accepted ways to increase usage of cataract services is by extending ophthalmic care facilities to rural areas through mobile eye units, thereby bringing cataract surgical services more close to affected individuals.[9] However, results of camp surgery can be poor, mainly because of low-quality pre-operative examination and limited availability of sophisticated equipment. For these reasons, the quality and safety of surgery in eye camps is often questioned and high-quality cataract surgery would only be possible in adequately equipped facilities.

An alternative concept is to screen patients in the field and transport them for surgery to a base hospital. Unfortunately, this concept is associated with high costs and a lower response rate, leaving eye camps the most effective way for people in remote rural areas to provide access to cataract surgery. In this article, we report that high-quality cataract surgery in the field is possible, even under primitive circumstances. We showed that skilled surgeons and a good organization make it feasible to perform phacoemulsification with topical anaesthesia with good visual outcome and low complication rate in the middle of the Amazon rain forest.

The surgical missions were set up to provide ophthalmic care to isolated Maroon and Amerindian tribes in the hinterland of Suriname. As in other developing countries, our medical team had to deal with dense and mature cataracts.[10] The only patient selection criteria for cataract surgery were visual acuity in relation to bio-microscopy findings. Although most patients were unfamiliar with any surgical procedure, no sedation was used. Particularly the language barrier between the surgeons and the patients imposed a major challenge, particularly in patients presenting with comorbidities such as pseudo-exfoliation, corneal scars, and extending pterygia. Despite these obstacles, results were good, showing improved uncorrected visual acuity in the majority of patients. The number of posterior capsular ruptures was also within the range of complications reported in the literature [11-12] and no cases of endophthalmitis occurred.

Cataract surgery is among the most cost-effective interventions in ophthalmology [13], and has evolved from intra capsular cataract extraction to phacoemulsification surgery. While phacoemulsification is currently the standard surgical technique for cataract surgery in most western countries, it is not widely used in developing countries.[1] It requires costly equipment and consumables and has a learning curve for the surgeons.[1; 14-16] Instead, manual small incision cataract surgery (MSICS) is gaining popularity in many developing countries.[17] This technique

is less efficacious than phacoemulsification and theoretically carries a greater risk of inflammation, cystoid macular oedema, and astigmatism.[1] However, it is faster, less technology-dependent, and less costly [1], and thus better attuned to the generally limited resources in developing countries. Yet, clinical trials have shown that phacoemulsification accomplishes better uncorrected visual acuity than MCICS.[1-18] Obviously, this is a major advantage in remote (tropical Amazon) areas were obtaining a reliable subjective refraction is complicated and time consuming because of illiteracy and a language barrier.

We prefer the use of topical anaesthesia since it does not subject patients to the potential complications of retro- or peribulbar injections such as globe perforation[19], retinal detachment with retinal vascular occlusion [20], optic nerve injury [21], brainstem anaesthesia [22] and cardiopulmonary arrest. [23] Generally for phacoemulsification, topical anaesthesia provides comparable relief of pain and avoids all the complications associated with injections. In the field, the use of topical anaesthesia is even more practical because the surgeons can easily perform it; it is also safe (no need for patient monitoring by an anaesthesiologist), effective [6], less time consuming (fast patient turnover), and less costly than the use of injections. Some concerns have been expressed regarding an increased risk of intraoperative complications of topical anaesthesia due to unrestricted eye movements and insufficient pain control. [24] However, studies have shown that phacoemulsification under topical anaesthesia in random patient populations and without sedation may serve well in routine cataract surgery.[6-12] In addition to these results, we report that phacoemulsification under topical anaesthesia is safe and feasible, even in the middle of the tropical rain forest and under the circumstances of a language barrier.

In conclusion, this report confirms the feasibility of high-quality cataract surgery in remote areas in the Amazon. Future prospective studies with a larger patient population should include a more complete ophthalmic examination (*i.e.*, refraction, intra- ocular pressure measurement, and cataract grading) to better assess the quality of cataract services, as well as assessments of the gains in quality of life. It is clear that that bringing high quality surgery to the hinterland anywhere on the globe will significantly contribute to the achievement of the Vision 2020 goal to eliminate cataract as a cause of blindness in these areas.

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